

FEASIBILITY STUDY

**Widening of US 321
from Tennessee State Line to US 421**

Avery and Watauga Counties

Division 11

FS-0511A



**Prepared by the
Program Development Branch
N. C. Department of Transportation**

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I. General Description

This feasibility study describes the proposed widening of US 321 from the Tennessee State Line to US 421, a distance of approximately 10.4 miles. The project location is shown on Figure 1. As part of the study, two different cross-sections were investigated, the details of which are as follows:

- ♦ **ALTERNATIVE 1:** Four-lane divided shoulder section, with a narrow raised grass median on variable width right-of-way.
- ♦ **ALTERNATIVE 2:** Five-lane shoulder section on variable width right-of-way.

This is the initial step in the planning and design process for this project and is not the product of exhaustive environmental or design investigations. The purpose of this study is to describe the proposed project including cost, and to identify potential problems that may require consideration in the planning and design phases.

II. Background

The purpose of this project is to improve the traffic safety and operations along US 321. Watauga County and the High Country Rural Planning Organization support this project.

US 321 is designated as a principal arterial in the North Carolina Statewide Functional Classification System and the 2002 Watauga County Thoroughfare Plan. US 321 is currently a two-lane shoulder section with varying pavement widths from 21-22 feet from edge of pavement to edge of pavement. US 321 is also part of the Gastonia to Johnson City, Tennessee Strategic Highway Corridor. On the 2004 Strategic Highway Corridor Vision Plan, US 321 is designated as an expressway facility. The development along US 321 is rural residential.

The following are Transportation Improvement Program (TIP) projects located within the project corridor:

- TIP# B-3922: Replace Bridge Number 316, which carries SR 1149 (Howard Edmisten Road) over Cove Creek. B-3922 is currently under construction.

- TIP# B-4668: Replace Bridge Number 29, which carries US 321 over Cove Creek. B-4668 is scheduled for right-of-way acquisition in 2008.
- TIP# R-2615: Widen US 421/321 to multilanes from Tennessee State Line to the proposed Boone Bypass (U-2703). R-2615 is currently an unfunded project.

There are several bridges in the project corridor. Please see Table 1 for detailed bridge information.

III. Traffic and Safety

The current year Average Daily Traffic (ADT) along US 321 ranges from 1,500 vehicles per day (vpd) just east of the Tennessee State Line to 7,500 vpd just west of US 421. For the design year 2035, the traffic volume along US 321 is estimated to range between 4,900 vpd just east of the Tennessee State Line to 15,000 vpd just west of US 421. Truck traffic is estimated to make up approximately 6 percent of the daily traffic.

The existing segment of US 321 operates at a level of service (LOS) D under current traffic volumes. If no improvements are made in the 2035 design year, it is projected that the intersection at SR 1117 (Mast Gap Road) and US 321 and the intersection at US 421 and US 321 will operate at a LOS F. With the proposed improvements, US 321 is projected to operate at a LOS D or better.

Between 2001 and 2004, 148 total crashes were reported within the project limits. The crash rate for US 321 is 300.88 crashes per 100 million vehicle miles (crashes/100MVM) traveled. This rate is significantly higher than the statewide rate of 170.47 crashes/100MVM for two-lane undivided rural United States routes. There were 65 injury crashes, 83 property damage only crashes, and no fatal crashes. The most prevalent types of crashes were Rear End (25%), Ran Off Road (23%), and Fixed Object (19%). These kinds of crashes are indicative of a narrow roadway with poor alignment and narrow shoulders. With the proposed widening and improvements to both the alignment and shoulder widths, the likelihood of these types of crashes should be significantly reduced.

IV. Description of Alternatives

It is proposed to widen US 321 to a multilane facility from the Tennessee State Line to US 421, a distance of approximately 10.4 miles. The project location is shown on Figure 1.

ALTERNATIVE 1: Four-lane divided shoulder section, 79' from edge of pavement to edge of pavement, with 12' lanes, a 23' raised grass median, and 8' shoulders (4' of which are paved) on variable width right-of-way. Due to the mountainous topography, the necessary right-of-way will range from 150' to 500'. All options under Alternative 1 include a new bridge over Beech Creek, a new culvert at Laurel

Creek, the widening of existing bridge (Bridge No. 61) over the Watauga River, a new culvert at Phillips Branch, a new bridge over Phillips Branch, a new bridge over Cove Creek, and the widening of existing culvert (Bridge No. 28) at Brushy Fork Creek, the costs of which are included in all options below.

In addition to the proposed widening of US 321, all options under Alternative 1 include the multilane widening of US 421 to a four-lane divided shoulder section with 12' lanes, a 30' raised grass median, and 8' shoulders (4' of which are paved) on variable width right-of-way for a distance of approximately 0.7 miles.

Option A: This option proposes an at-grade intersection at US 421. Given that signalization may be required, consideration should be given to a restrictive left turn concept (i.e. superstreet) with U-turns during later planning and design studies.

With this proposed cross-section, it is anticipated that there will be fifty-seven (57) residences and sixteen (16) businesses relocated due to this project. The total cost of this alternative, including construction and right-of-way, is estimated to be \$117,900,000.

Right-of-way.....	\$26,900,000
Construction.....	\$91,000,000
Total Cost (Alternative 1 – Option A).....	\$117,900,000

The following Y-Line intersection realignments are recommended and are included in the costs shown above:

- SR 1316 (Flat Springs Road)
- SR 1176 (Trivette Circle)
- SR 1123 (Laurel Creek Road)
- SR 1103 (Herbert Thomas Road)
- SR 1233 (Old US 421 Road)
- SR 1410 (Westside Drive)

Option B: This option proposes an interchange at US 421. Also included in this option is a new bridge over Brushy Fork Creek.

With this proposed cross-section, it is anticipated that there will be sixty-five (65) residences and sixteen (16) businesses relocated due to this project. The total cost of this alternative, including construction and right-of-way, is estimated to be \$132,100,000.

Right-of-way.....	\$31,700,000
Construction.....	\$100,400,000
Total Cost (Alternative 1 – Option B).....	\$132,100,000

The following Y-Line intersection realignments are recommended and are included in the costs shown above:

- SR 1316 (Flat Springs Road)
- SR 1176 (Trivette Circle)
- SR 1123 (Laurel Creek Road)
- SR 1103 (Herbert Thomas Road)
- SR 1233 (Old US 421 Road)
- SR 1310 (Willow Church Road)
- Jimmy Billings Road

ALTERNATIVE 2: Five-lane section, 68' from edge of pavement to edge of pavement, with 12' lanes and 8' shoulders (4' of which are paved) on variable width right-of-way. Due to the mountainous topography, the necessary right-of-way will range from 150' to 500'. All options under Alternative 2 include a new bridge over Beech Creek, a new culvert at Laurel Creek, the widening of existing bridge (Bridge No. 61) over the Watauga River, a new culvert at Phillips Branch, a new bridge over Phillips Branch, a new bridge over Cove Creek, and the widening of existing culvert (Bridge No. 28) at Brushy Fork Creek, the costs of which are included in all options below.

In addition to the proposed widening of US 321, all options under Alternative 2 include the multilane widening of US 421 to a four-lane divided shoulder section with 12' lanes, a 30' raised grass median, and 8' shoulders (4' of which are paved) on variable width right-of-way for a distance of approximately 0.7 miles.

Option A: This option proposes an at-grade intersection at US 421. Given that signalization may be required, consideration should be given to a restrictive left turn concept (i.e. superstreet) with U-turns during later planning and design studies.

With this proposed cross-section, it is anticipated that there will be fifty-seven (57) residences and sixteen (16) businesses relocated due to this project. The total cost of this alternative, including construction and right-of-way, is estimated to be \$106,600,000.

Right-of-way.....	\$26,900,000
Construction.....	\$79,700,000
Total Cost (Alternative 2 – Option A).....	\$106,600,000

The following Y-Line intersection realignments are recommended and are included in the costs shown above:

- SR 1316 (Flat Springs Road)
- SR 1176 (Trivette Circle)
- SR 1123 (Laurel Creek Road)
- SR 1103 (Herbert Thomas Road)

- SR 1233 (Old US 421 Road)
- SR 1410 (Westside Drive)

Option B: This option proposes an interchange at US 421. Also included in this option is a new bridge over Brushy Fork Creek.

With this proposed cross-section, it is anticipated that there will be sixty-five (65) residences and sixteen (16) businesses relocated due to this project. The total cost of this alternative, including construction and right-of-way, is estimated to be \$122,800,000.

Right-of-way.....	\$31,800,000
Construction.....	\$91,000,000
Total Cost (Alternative 2 – Option B).....	\$122,800,000

The following Y-Line intersection realignments are recommended and are included in the costs shown above:

- SR 1316 (Flat Springs Road)
- SR 1176 (Trivette Circle)
- SR 1123 (Laurel Creek Road)
- SR 1103 (Herbert Thomas Road)
- SR 1233 (Old US 421 Road)
- SR 1310 (Willow Church Road)
- Jimmy Billings Road

V. Community Issues

A detailed investigation was not conducted for this feasibility, however no impacts to schools, parks, recreation areas, or community facilities are anticipated with this project.

Maps at the Survey and Planning Branch of the North Carolina State Historic Preservation Office were used to determine if any historic properties on the National Register of Historic Places (NRHP) or state study lists exist within the proposed project corridor. The following properties located within the project corridor were found to be potentially historic properties:

- Ward Family House
- Walker-Harmon Farm
- Joe Harmon Farm
- Antioch Baptist Church
- Andy Payne – A. C. Mast Store
- Judge John Bingham House
- Zionhill Baptist Church
- Malden Harmon House

The project corridor is located in a land trust priority area.

VI. Natural Environment Issues

The following is a preliminary review of environmental issues that might have a potential impact to the project. The information obtained for the environmental screening is from a Geographic Information System (GIS) database. The purpose of the environmental screening is to identify potential environmental issues early in the process.

Stream Classification

The proposed project corridor is located in the Watauga River Basin. US 321 crosses several water bodies in the project corridor. Beech Creek and Laurel Creek have a stream classification of C Tr. Cove Creek, Phillips Branch, and Brushy Fork Creek have a stream classification of C. The Watauga River has a stream classification of B HQW. These water bodies will likely need to be surveyed and have the appropriate coordination with the North Carolina Department of Environment and Natural Resources (NCDENR) and the U.S. Army Corps of Engineers (USACE) during any environmental document study. The project corridor is also located in a high quality water zone.

Wetlands

US 321 crosses wetlands associated with Beech Creek, Laurel Creek, Watauga River, Cove Creek, Phillips Branch, and Brushy Fork Creek. Permitting with the U.S. Army Corps of Engineers (USACE) will likely need to be obtained before construction of the project, and appropriate mitigation measures should be taken if deemed necessary.

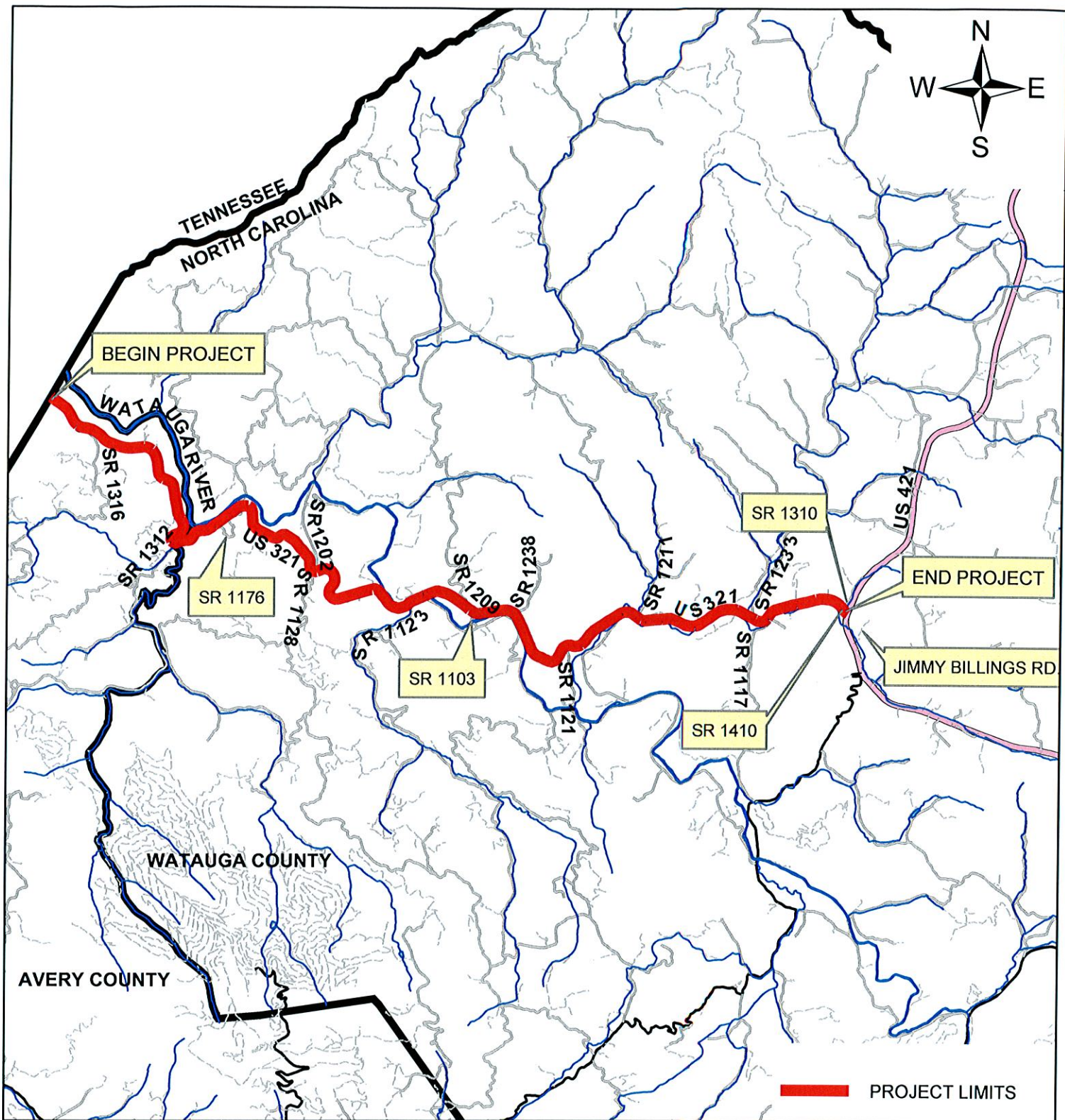
Threatened and Endangered Species

Beech Creek, Laurel Creek, and the Watauga River are designated as trout streams.

VII. Recommendations

ALTERNATIVES 1 (OPTIONS A & B) & 2 (OPTIONS A & B): It was found that both the four-lane divided shoulder section (Alternative 1 - Options A & B) and the five-lane shoulder section (Alternative 2 - Options A & B) would be able to accommodate the projected 2035 design year traffic volumes with an acceptable level of service. However, five-lane sections tend to promote indiscriminate left turn movements, while four-lane divided sections prevent indiscriminate left turn movements and allow pedestrian refuge if needed. Based on the Strategic Highway Corridor designation for this facility, the use of traffic signals is discouraged. Therefore, an interchange at the intersection of US 321 and US 421 is preferred. ***Because of the factors, Alternative 1 – Option B would be the preferred alternative for the proposed widening of US 321.***

The total estimated project cost of the preferred Alternative #1 – Option B with a four-lane divided shoulder section, 12' travel lanes, a 23' raised grass median, 8' shoulders (4' of which are paved) on variable width right-of-way, an interchange at the intersection of US 321 and US 421, a new bridge over Beech Creek, a new culvert at Laurel Creek, the widening of existing bridge (Bridge No. 61) over the Watauga River, a new culvert at Phillips Branch, a new bridge over Phillips Branch, a new bridge over Cove Creek, the widening of existing culvert (Bridge No. 28) at Brushy Fork Creek, a new bridge over the Brushy Fork Creek, the widening of US 421, and all recommended Y-Line intersection realignments is \$132,100,000. It is anticipated that a total of sixty-five (65) residences and sixteen (16) businesses will be relocated along US 321.



0 5,000 10,000 20,000 Feet

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
PROGRAM DEVELOPMENT BRANCH

FS-0511A

US 321
FROM TENNESSEE STATE LINE TO US 421

AVERY AND WATAUGA COUNTIES

DIVISION 11

FIGURE 1



FS-0511A: US 321 from Tennessee state line to US 421

Avery County

Structure Number	Facility Carried	Feature Intersected	Structure Description	Structure Length	Horizontal Clearance	Year Constructed	Sufficiency Rating	Proposed Treatment
C2	US 321	Beech Creek	Double 30'x19' RC arch culvert	64'	24'	1952	71.5	None

Watauga County

Structure Number	Facility Carried	Feature Intersected	Structure Description	Structure Length	Horizontal Clearance	Year Constructed	Sufficiency Rating	Proposed Treatment
C28	US 321/US 421	Brushy Fork Creek	Triple 8' x 9' RCBC	27'	23'	1955	98.5	Extend
29	US 321	Cove Creek	Reinforced concrete deck on girders	84'	23.8'	1936	51.6	Replace
C54	US 321	Phillips Branch	Triple 6'x7' RCBC	27'	20'	1950	86.4	Replace
61	US 321	Watauga River	Reinforced concrete deck on prestressed concrete girders	253'	34'	1986	98.7	Widen to multilanes
C66	US 321	Laurel Creek	Single 30'x19' RC arch culvert	30'	22'	1952	68.7	Replace
106	SR 1117	Brushy Fork Creek	Triple 11' x 9' RCBC	34	22'	2005	99.4	None
316	SR 1149	Cove Creek	Timber floor on continuous I-beams	96'	19.2'	1964	11.5	Replace

Table 1: Existing Bridge Information